Electromagnetism

the key to a new wave of high–tech products

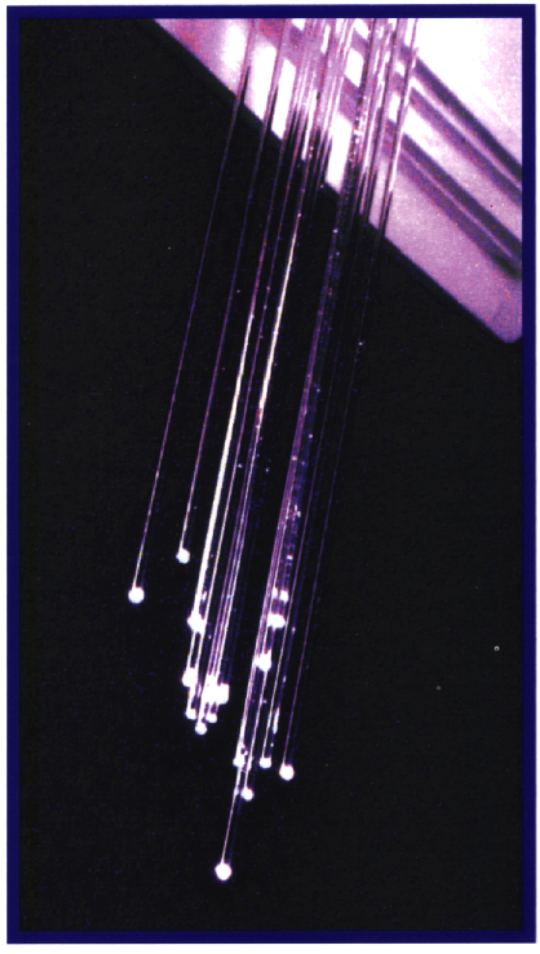
Electricity, magnetism, and light waves are all aspects of electromagnetism, one of the fundamental forces of nature and the one most directly involved in the technology we use to enhance our lives. BES scientists are using their knowledge of electromagnetic phenomena to help industry bring forth a host of high-tech products that span the information superhighway, national security, the environment, and energy efficiency.

The demand for increased capacity to store computer data grows at least as fast as advancing computational power. Some BES-sponsored research is aimed at innovative technologies with the potential for higher storage capacity than presently available, while other projects seek to upgrade substantially the performance of conventional magnetic disks with new magnetic materials and protective coatings.

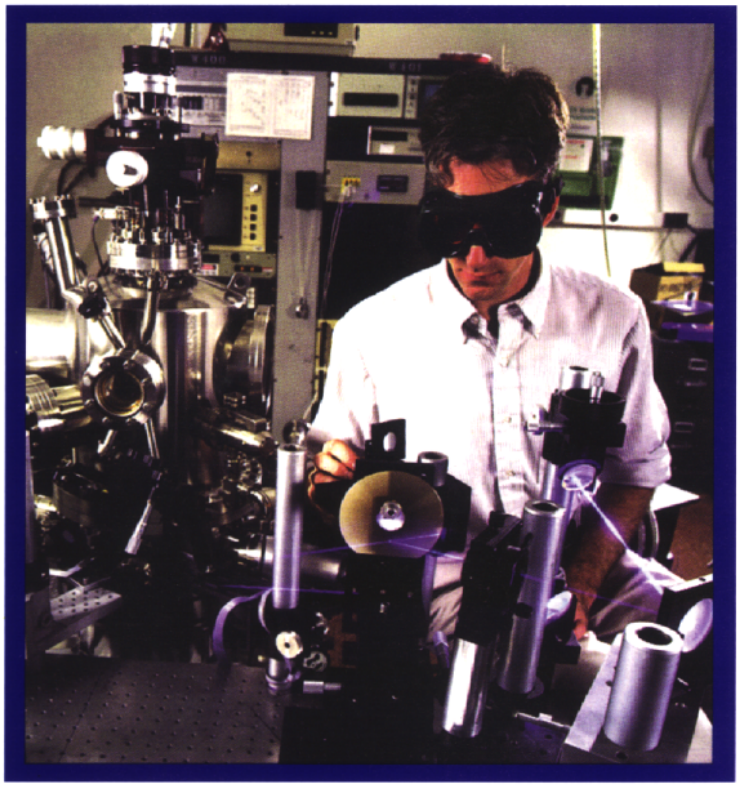
Optical communication, which has already replaced older technology in some of the Nation's telecommunications systems, is the key to high-capacity data transmission on the information superhighway. BES scientists are making important contributions with work on optical fibers and cables, lasers, and optical materials for guiding and manipulating light waves.

Since they burst on the scene in the research laboratory three decades ago, lasers have become the light source of choice for an immense variety of uses. BES researchers are working to perfect high-power lasers and develop lasers that can be tuned to any wavelength within a broad spectrum. They are also working on high-efficiency solid-state lasers and their cousins, light-emitting diodes.

Solar cells and photo detectors work by the same principle — the absorption of light waves generates an electric current or voltage. In the renewable energy field, work at BES laboratories is leading toward advanced solar cells. At other BES facilities, efforts are under way to improve infrared-detector materials and devices for remote environmental monitoring and satellite surveillance.

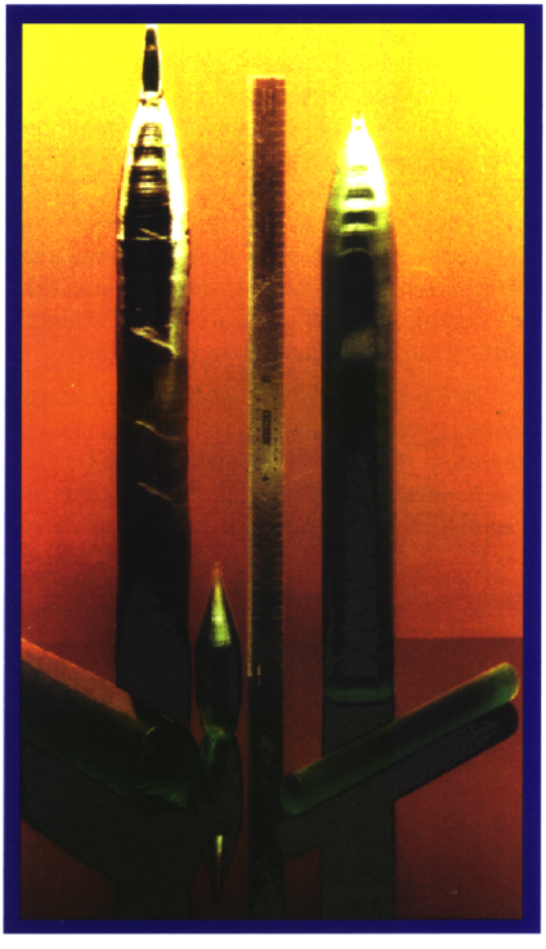


These lead phosphate glass fibers are resistant to corrosion and weather. Because they collect almost all the light injected into them, they potentially can be used for optical communication on the information superhighway and for other light-guiding applications. The same innovative technology from Oak Ridge National Laboratory has been licensed to Komwave Corporation for use in making glass-to-metal seals.



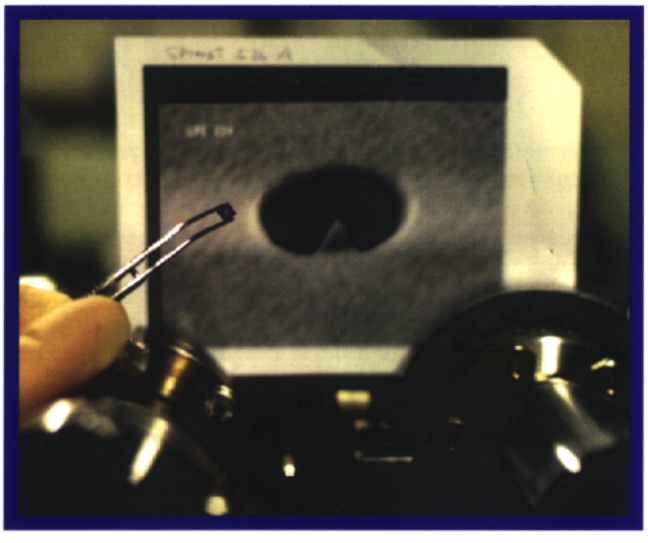
Carbon Coatings

(left) Making and evaluating the carbon coating that protects computer hard disks are key requirements for increasing the storage capacity and reliability of magnetic storage devices. In collaboration with Seagate Magnetics, Lawrence Berkeley National Laboratory has developed a laser technique that reduces the need for destructive, time-consuming mechanical testing of the coatings.



Solid State Lasers

(right) A research team at Lawrence Livermore National Laboratory has developed a new class of solid-state laser materials with superior properties for operation over a wide wavelength range at high power levels or with ultrashort pulses. The technology has been licensed to several companies, including Lighting Optical Corporation, that market the materials to laser manufacturers.



Flat Panel Displays

(left) Ames Laboratory and Amoco Technology Company are researching new flat-panel displays. These devices are based on the emission of electrons from arrays of tiny conical tips, such as those shown in the electron microscope image behind the tweezers holding a test array. This field-emission technology promises resolution comparable to conventional displays combined with higher brightness.